Mech 371 – Fluid Mechanics I

Fall 2012

Instructor: Professor Brent C. (B.C.) Houchens
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office hours: 2-4 PM Mondays, 3-5 PM Thursdays help session: Sundays, 8 PM
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Class Meets: 1:00 - 2:15 PM Tues/Thurs, 210 Herzstein

Text: *Fluid Mechanics: Fundamentals and Applications*, Cengel & Cimbala, McGraw-Hill, 2006. (or later)

Web Site: https://owlspace-ccm.rice.edu/portal

Grading: Homework: 15%
Exam 1: 20%, Exam 2: 20%, Exam 3: 22.5%, Exam 4: 22.5%

minimum guaranteed grades will be assigned as follows:

98.5-100: A+	92-98.4: A	90-91.9: A-
87-89.9: B+	82-86.9: B	80-81.9: B-
77-79.9: C+	72-76.9: C	70-71.9: C-
67-69.9: D+	62-66.9: D	60-61.9: D-
below 60: F		

Homework: Homework is due at the beginning of class. Please put your name, the course number, and the homework set number on the top page and staple (**write neatly, on only one side of the page**). Working in groups on homework is encouraged, but **you must submit your own solution**. No late homework will be accepted. Homework should show clear logic. **Carry out solutions in variable form and, where applicable, substitute numerical values at the end**. Pay close attention to maintaining correct dimensions. **Box or underline the final answer or expression.**

Exams: There will be four exams. Each covers material that is largely independent of the others.

Objectives	Outcomes
Students should understand:	***Students completing the course should be able to:***
1. hydrostatic pressure variations.	1a: evaluate pressure variation with depth on submerged surfaces 1b: evaluate pressure variation during acceleration of fluids in rigid body systems.
2. the equations governing mass and momentum conservation for continuum fluids.	2a: describe the assumptions associated with deriving the governing mass and momentum conservation equations for continuum flow. 2b: explain the physical meaning of terms in the governing mass and momentum conservation equations for continuum flow, in both integral and differential forms.
3. the use of the integral forms of the governing equations to analyze control volume systems.	3a: simplify the integral equations by qualitatively identifying the dominant terms. 3b: estimate the pressures, velocities, forces and moments on components such as pumps, turbines and piping systems.
4. the use of the differential forms of the governing equations to find velocity and pressure fields.	4a: simplify the differential equations by qualitatively identifying the dominant terms. 4b: solve the governing differential equations to determine velocity and pressure fields for basic but relevant boundary conditions and geometries.
5. the requirements for a flow to be considered incompressible or compressible, viscous or inviscid, and steady or unsteady.	5a: carry out dimensional analysis on the relevant parameters of a system and propose analogous experiments that maintain similarity. 5b: scale/nondimensionalize the governing equations, identify nondimensional groups and simplify the equations based on limiting values of the groups.
6. incompressible flow physics, including laminar and turbulent flow, transitions and evaluation of associated quantities.	6a: evaluate the impact of area change, mass addition, friction and minor losses on piping and duct systems, for laminar and turbulent flows. 6b: predict form drag, friction drag and lift resulting from flow around objects, including airfoils, for laminar and turbulent flows. 6c: apply boundary layer theory to quantitatively evaluate drag and boundary layer thickness and predict separation and transition to turbulence.

Absence Policy: Absence during any scheduled exams must be approved at least 4 hours in advance via email to houchens@rice.edu, barring a documentable emergency.

Honor Code: Homework, projects and exams are subject to Rice's Honor Code.

Notice: Any student with a disability requiring accommodations in this course is encouraged to contact me after class or during office hours. Additionally, students should contact Disability Support Services in the Ley Student Center.